A Multi-dimensional Histogram Technique For Flagging Rain Contamination on QuikSCAT

James Huddleston and Bryan Stiles
Jet Propulsion Laboratory, California Institute of Technology
4800 Oak Grove Dr. Pasadena, CA 91109

Abstract

The SeaWinds on QuikSCAT scatterometer (QSCAT) was developed by NASA JPL to measure the speed and direction of ocean surface winds. Due to the relatively high incidence angle at which the measurements are taken, rain contamination can adversely affect wind vector accuracy. An investigation has been undertaken to determine a set of observable parameters which may be computed from the scatterometer measurements and which are sensitive to the presence of rain. Four such parameters have been identified: 1) normalized beam difference, which indicates a statistically significant imbalance in the beams relative to the model function, 2) the maximum likelihood estimate calculated by the wind retrieval algorithm, 3) the direction of the first rank wind ambiguity relative to the swath, and 4) the first rank wind speed. Multidimensional histograms of these parameters are computed in the presence and absence of rain (according to co-located SSM/I observations). These histograms are then used to estimate the conditional probability of rain given the parameters. Finally, the probability estimate is then used to flag rain contaminated cells. The performance of the rain flag is illustrated using a number of metrics, including speed and directional histograms with and without flagging, the effect of flagging on wind retrieval performance metrics, and the false alarm and undetected rain rates relative to SSM/I. Graphical depictions of rain flagging performance are also presented for example wind fields.